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Air under the diaphragm—perforation or Chilaiditi sign?

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ABSTRACT

Chilaiditi sign is a rare radiological finding in which the colon is interposed between the liver and the abdominal wall. Once patients become symptomatic, the condition is called Chilaiditi syndrome. We discuss a unique patient who presented with intermittent abdominal pain for 2 years that worsened 6 months before presentation. Her radiological evaluation revealed Chilaiditi sign. She was treated conservatively and the sign resolved. We emphasize the importance of conservative management in Chilaiditi syndrome.

KEYWORDS Chilaiditi anomaly; Chilaiditi sign; Chilaiditi syndrome; hepatodiaphragmatic interposition; pneumoperitoneum

Chilaiditi sign is a rare radiographic presentation in which the colon is interposed between the liver and the abdominal wall. Hepatic flexure of the colon is usually involved; however, the small bowel has been implicated in a small number of cases.[1] The prevalence of Chilaiditi syndrome in the general population is 0.025% to 0.28%.[2–4] It is more common in men than in women, with a ratio of 4:1. Increased incidence is seen in individuals >60 years.[5] Initially, congenital anomalies like the absence of falciform or suspensory ligament were assumed to cause this syndrome.[3] Cirrhosis, diaphragmatic paralysis, obesity, and procedures like colonoscopy were also believed to cause it.[3,6] As this syndrome is not frequently reported, any air or gas around the diaphragm and liver is presumed to be of surgical pathology and invasive intervention may result.

CASE REPORT

A 57-year-old woman presented with a complaint of postprandial abdominal pain for 2 years, which had worsened over the previous 6 months. The pain was in the right upper quadrant of the abdomen, gradual in onset, dull-aching type, 7 out of 10 in intensity, and associated with nausea, vomiting, and weight loss of 100 pounds over the last 2 years. Her past medical history was significant for irritable bowel syndrome, ulcerative colitis, gastroesophageal reflux disease, diabetes mellitus, subclinical hyperthyroidism, and chronic constipation treated with laxatives. Her vital signs were stable. She was afebrile with normal oxygen saturation. Her body mass index was 26.64 kg/m^2. Abdominal examination revealed tenderness in the right upper quadrant without guarding or rigidity. All other systemic investigations were normal. Computed tomography (CT) showed findings consistent with Chilaiditi syndrome *(Figure 1a, 1b)*.

She was managed conservatively with bowel rest, intravenous fluids, ondansetron for nausea and vomiting, morphine for abdominal pain, and laxatives. Upper endoscopy revealed esophagitis and gastritis pending biopsies, and the patient was started on sucralfate 1 g four times a day, pantoprazole, and a soft diet. Her symptoms improved on hospital day 2; she had minimal pain with no more diarrhea or vomiting. Chest and abdominal x-ray did not show any acute findings in the abdomen *(Figure 1c, 1d)*; the Chilaiditi sign had resolved.

The patient was discharged on hospital day 6 on tramadol, pantoprazole, and lactulose solution. At 1-week follow-up, she had no vomiting but did have nausea and abdominal pain; the examination revealed right upper quadrant tenderness without rebound. Repeat x-ray of the abdomen did not

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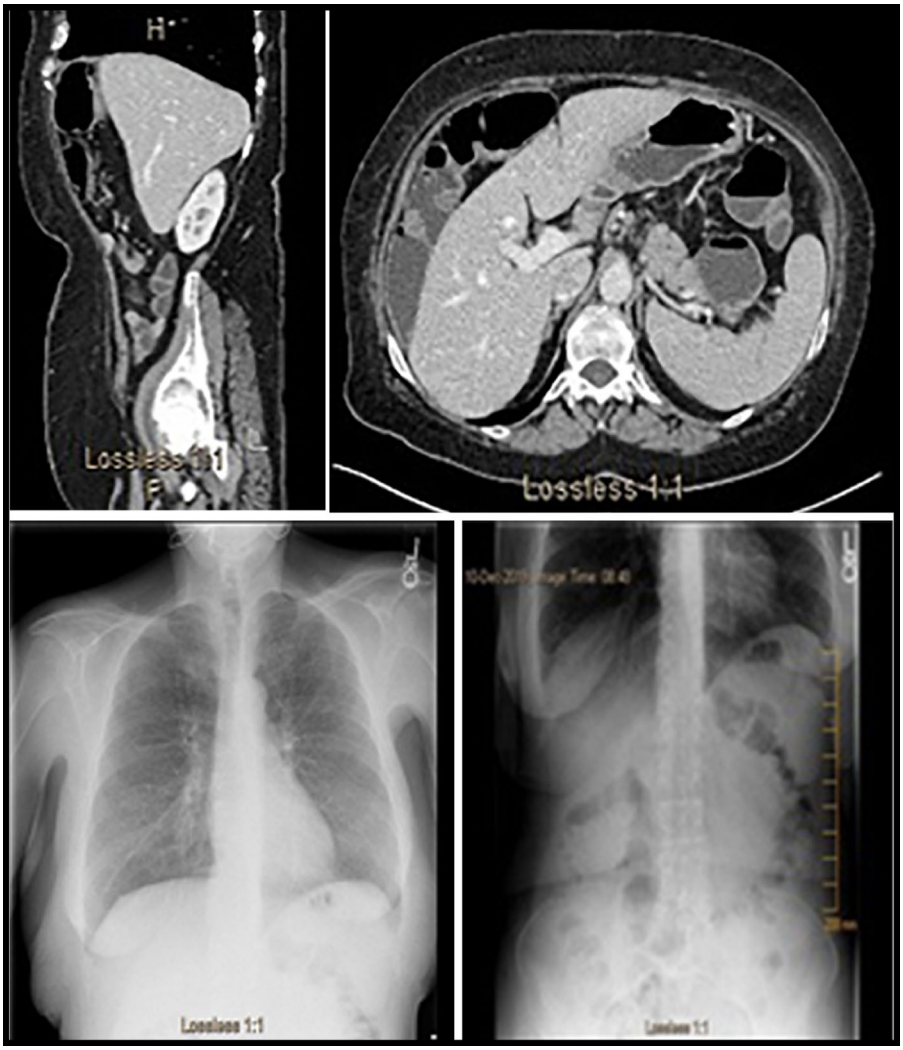

Figure 1. **(a)** Axial and **(b)** sagittal views of abdominal and pelvic CT with oral and intravenous contrast showing interposition of the large bowel with haustrations between the undersurface of the liver and diaphragm, signs of Chilaiditi syndrome. **(c, d)** Plain radiograph of chest and abdomen showing resolution of acute signs of abdomen—resolved Chilaiditi sign.

show Chilaiditi sign. The abdominal pain resolved at 3-month reevaluation.

DISCUSSION

Chilaiditi syndrome is one of the rarer diagnoses, usually made upon incidental discovery. This syndrome is postulated to be caused by anomalies secondary to anatomic malposition or functional disorders. Usually, the natural growth and laxity of suspensory ligaments prevent the interposition of the colon between the liver and diaphragm. The anatomic variability caused by congenital disorders (absence, increased laxity, or elongation of ligaments) or functional disorders (such as constipation or cirrhosis) might culminate into the faulty interposition.

The clinical presentation of Chilaiditi syndrome varies significantly. The most common manifestations are postprandial abdominal pain, vomiting, anorexia, and constipation. In some cases, it can also cause shortness of breath and intestinal obstruction.[3,5,7] It can lead to complications like volvulus of the cecum, splenic flexure, and transverse colon.[8–10] Physical examination ranges from a soft abdomen to abdominal distention with an absence of liver dullness.[7] The differential diagnoses of Chilaiditi syndrome include bowel obstruction, volvulus, intussusception, ischemic bowel, and perforation of the intestine and inflammatory conditions.

Management depends on presentation. Patients with radiographic evidence of Chilaiditi sign without any symptoms do not require any further treatment. In symptomatic patients, an immediate meticulous abdominal examination is needed to rule out acute abdomen requiring surgical intervention. Initial management of patients includes conservative management like bowel rest, intravenous fluid, nausea, and pain control. An abdominal x-ray should be performed to look for signs of perforation. A CT scan of the abdomen can better visualize these signs in stable patients.[11–13] For diagnosis, the patient must have the following findings on the

abdominal x-ray or CT scan (erect position: abdomen): distended bowel, a depressed superior margin of the liver below the level of the left hemidiaphragm, and elevation of the right hemidiaphragm above the liver by the intestine in between.[14] As it can easily be misdiagnosed as bowel perforation, patients are at high risk of unwarranted surgical interventions.[1,13,15]

The patient must be closely monitored if he or she continues to have abdominal pain and x-ray does not show any improvement. Rarely, complications may occur, such as bowel ischemia, which requires immediate surgical intervention. The surgical options are chosen based on the part of the intestine involved. For cecal involvement, cecopexy is usually performed, while for the involvement of transverse colon, which may be associated with a high occurrence of gangrene, colonic resection is preferred over colonoscopic resection.[3]

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